Atty. Dkt. No. 1423-9
Ser. No. 09/428,508

SUBMISSION OF CLAIM FOR PRIORITY AND CERTIFEID COPIES

Applicant hereby claims all priority rights granted under 35 U.S.C. 119 and the International Convention for the Protection of Industrial Property, and similar treaties.

A certified copy of each of the following Australian provisional applications: PO 6452 filed April 28, 1997; PO 7677 filed July 3, 1997; and PO 9901 filed October 21, 1997, is enclosed herewith.

Dated: 3/16/01

Respectfully submitted,

J. Warren Whitesel
Registration No. 16830
LAFF, WHITESEL & SARET, LTD
401 North Michigan Avenue, Suite 1700
Chicago, Illinois 60611
(312) 661-2100

JWW/dsr
C:\WINDOWS\Favorites\JWW\1423\0009\S CP+3CC 3-14-01.doc

AUSTRALIA

Patent Office
Canberra

I, KIM MARSHALL, MANAGER PATENT OPERATIONS hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. PO 6452 for a patent by SULCAL CONSTRUCTIONS PTY. LTD. filed on 28 April 1997.

I further certify that the above application is now proceeding in the name of ECOFLEX AUSTRALIA PTY LIMITED pursuant to the provisions of Section 113 of the Patents Act 1990.

I further certify that pursuant to the provisions of Section 38(1) of the Patents Act 1990 a complete specification was filed on 27 April 1998 and it is an associated application to Provisional Application No. PO 6452 and has been allocated No. 63625/98.

WITNESS my hand this
Ninth day of November 1999

3

KIM MARSHALL
MANAGER PATENT OPERATIONS

S & F Ref: 374868

ORIGINAL

AUSTRALIA

Patents Act 1990

PROVISIONAL SPECIFICATION FOR THE INVENTION ENTITLED:

Retaining Wall

Name and Address
of Applicant: ~~Sulcal Constructions Pty. Ltd., An Australian Company, ACN, 002 968 863, of 19 Ranclaud Street, Merewether, New South Wales, 2291, AUSTRALIA~~
EcoFlex Australia Pty Limited 081 641 518
41-45 Newcomen street
Newcastle N.S.W. 2300 AUSTRALIA

This invention is best described in the following statement:

RETAINING WALL

Technical Field

The present invention relates to retaining walls and in particular relates to a retaining wall utilising tyres in its construction.

Background of the Invention

All rubber tyres, such as are used in automotive, mining and aviation applications, have limited use once their primary service life has been exceeded. Whilst tyres may be retreaded several times to prolong their service life, they ultimately become unsuitable for their primary application. The disposal of discarded tyres then poses an environmental problem as they do not readily breakdown. Disposal as landfill is a typical, but non-optimal, solution.

Current retaining walls are typically constructed of concrete, timber or masonry / brick blocks. These materials are often expensive and their use results in the consumption of significant resources. The current inventor has found that discarded tyres can be used in the construction of retaining walls to both alleviate the tyre disposal problem and to reduce the expense and resource expenditure of retaining wall construction.

Object of the Invention

It is the object of the present invention to provide a retaining wall utilising tyres in its construction.

Summary of the Invention

There is disclosed herein a retaining wall for retaining an embankment or similar, comprising:

a plurality of tyres each having a cavity defined therein at least partially filled with a fill material, said plurality of tyres being arranged in a plurality of courses adjacent to said embankment; and

further fill material substantially filling gaps between each of said tyres and between said tyres and said embankment.

Typically said wall is offset from vertical at a batter angle of 10^0 to 20^0.

Typically each said tyre is arranged such that a central axis thereof is offset from vertical at an angle approximately equal to said batter angle.

Preferably adjacent said courses are separated by said further fill material.

Preferably adjacent said courses are separated by approximately half a tyre diameter.

Alternatively adjacent said courses abut.

Typically, said fill material comprises concrete in the lowermost said course.

Typically said fill material comprises a free draining material in at least some of said courses.

Typically said free draining material is granular.

Typically said free draining granular material includes cobble.

Alternatively said free draining fill material includes shredded tyres.

Typically said further fill material comprises a free draining granular material.

Typically at least some of said plurality of tyres are provided with drain holes.

Typically at least some of said tyres are each cut in a plane between opposing sidewalls thereof and arranged with both said sidewalls facing generally downwards to facilitate filling of said cavity with said fill material.

Preferably a section of each of said cut tyres remains uncut such that said sidewalls remain hingedly attached at said uncut section.

Alternatively at least some of said tyres each has its upper sidewall at least partially removed to facilitate filling of said cavity with said fill material.

Preferably said plurality of tyres is secured with rope.

Typically said retaining wall is substantially covered with a fire retardant.

Alternatively each of said plurality of tyres is individually covered with a fire retardant.

Brief Description of the Drawings

Preferred forms of the present invention will now be described by way of example with reference to the accompanying drawings wherein:

Figure 1 is a side elevation cross sectional view of a retaining wall according to a first embodiment of the current invention.

Figure 2 is a plan view of a tyre cut in a plane between opposing sidewalls.

Figure 3 is a side elevation cross sectional view of a retaining wall according to a second embodiment of the current invention.

Figure 4 is a sectional view of the retaining wall of Figure 3 at Section A-A

Detailed Description of the Preferred Embodiments

A preferred embodiment of a retaining wall 10 according to the current invention for retaining an embankment 100 or similar, comprises a plurality of tyres 11 each having a cavity 12 defined therein at least partially filled with a fill material 13. In the preferred embodiment, each cavity 12 is substantially filled with the fill material 13. The tyres 11 are arranged in a plurality of courses 14 adjacent to the embankment 100. Further fill material 15 substantially fills gaps between each of the tyres 11 and between the tyres 11 and the embankment 100.

The embankment 100 is typically excavated at an angle to the vertical of approximately 10^0 to 20^0, with the retaining wall 10 similarly having a batter angle of 10^0 to 20^0. In the preferred embodiments depicted, the retaining wall 10 has a batter angle of approximately 14^0. Taller walls will typically require a larger batter angle for stability, whilst smaller walls can employ smaller batter angles so as to reduce the space occupied by the retaining wall 10. As well as for retaining typical embankments as used in landscaping and the like, retaining walls of the current invention may be used with other embankments including those used as noise barriers or waterway walls (sea walls).

Each tyre 11 is here arranged such that a central axis thereof is offset from vertical at an angle approximately equal to the batter angle. With this incline of the tyres 11 to match the batter angle, the stability of the wall 10 is enhanced by reducing the reliance on friction between the courses 14 of tyres 11 for shear stability. In retaining wall designs where shear stability is not of prime concern, the tyres 11 can be laid flat with each subsequent course 14 set back from the adjacent lower course 14 to provide the batter angle of the wall 10.

The tyres 11 are typically arranged such that the tyres 11 of a given course 14 are offset from those of the adjacent lower course 14 in a typical brickwork fashion. In the preferred embodiments depicted, adjacent courses 14 are separated by the further filler material 15, here giving a separation between courses 14 of approximately half a tyre 11 diameter. Alternatively, the tyres 11 of adjacent courses 14 may abut, with the further filler material 15 filling gaps between surfaces of the adjacent tyres 11 which do not abut.

The tyres 11 are also typically separated from the embankment 100 by the further filler material 15. Alternatively the tyres 11 may abut the embankment 100 with the further filler material 15 filling gaps where the surface of the tyres 11 do not abut the embankment 100.

For larger retaining walls as depicted in Figures 3 and 4, Two rows 16a,16b of tyres 11 may be used to complete each course 14. Utilisation of two rows 16a,16b increases the stability of the retaining wall 10 enabling increased wall height. The adjacent tyres 11 in the two rows 16a,16b are typically horizontally offset as depicted in Figure 4 and may also be vertically offset as depicted in Figure 3.

The foundation 101 for the retaining wall 10 is here excavated below the ground line 102 to help secure the lowermost course 14a in place. To further secure the lowermost course 14a, the tyres 11 thereof are filled with concrete as the fill material 13. A stabilised sand base may be employed for the foundation 101. For construction with a waterway wall, where the tyres 10 will act as the interface with the water, every second course of tyres 11 is typically filled with concrete to increase the mass of the wall and thereby reduce any possible instability resulting from wave action.

The fill material 13 comprises a free draining material in at least some of the courses 14. Here the free draining fill material 13 is granular and is used in all but the lowermost course 14a. Cobble has been found to be a suitable fill material 13, whilst the use of other free draining materials, including shredded tyres is envisaged. Use of shredded tyres further increases the recyclability of the discarded tyres, but they should not be used where the wall construction relies on its mass for stability.

The further fill material 15, used to fill gaps between tyres 11 and between the tyres 11 and embankment 100 is also here a free draining granular material such as cobble. To

further assist in drainage, drain holes 17 may be provided in the tyres 11, and a socked perforated sub-surface drain 18 or similar may be laid between the lowermost course 14a and the embankment 100.

Figure 2 depicts a tyre as used in a preferred embodiment wherein at least some of the tyres 11 are each cut in a plane between opposing sidewalls 19 thereof and arranged with both of the sidewalls 19 facing generally downwards. This results in the inner concave surface of each of the sidewalls 19 facing upwards, facilitating filling of the cavity 12 with fill material 13 in the region of the sidewalls 19. A section 20 of the tyre 11 may remain uncut such that the sidewalls 19 remain hingedly attached at the uncut section 20. Rather than cutting each tyre 11 into opposing halves, the upper sidewall of the tyres 11 may be at least partially removed to facilitate filling of the cavity 12.

To increase the stability of the retaining wall 10, the tyres 11 may be secured to each other, and if so desired to the embankment 100 or foundation 101 with the use of nylon rope or similar. Reinforcing grids may also be used to secure one or more of the courses 14 of tyres 11 to the embankment 100. Such a reinforcing grid would typically extend at least approximately 0.7 m into the embankment 100, depending on the wall 10 design, to ensure stability and allow the construction of taller retaining walls 10. The embankment 100 may be compacted to more securely hold the reinforcing grid in place.

To reduce any fire hazard which the use of rubber tyres may pose, the retaining wall 10 as a whole, or each of the tyres 11 individually, may be covered with a fire retardant material or coating. Such a material which may be used is geofabric which is also typically used as a liner 21 between the embankment 100 and the retaining wall 10.

Engineering analysis has indicated that retaining walls 10 constructed in accordance with the preferred embodiment perform comparably with current typical retaining walls such as timber crib, concrete crib or segmental brickwork walls, whilst typically being less expensive, lighter in weight and providing a solution to the problem of discarded tyre disposal.

Dated 28 April, 1997

~~Sulcal Constructions Pty Ltd~~
Ecoflex Australia Pty Limited.

Patent Attorneys for the Applicant/Nominated Person

SPRUSON & FERGUSON

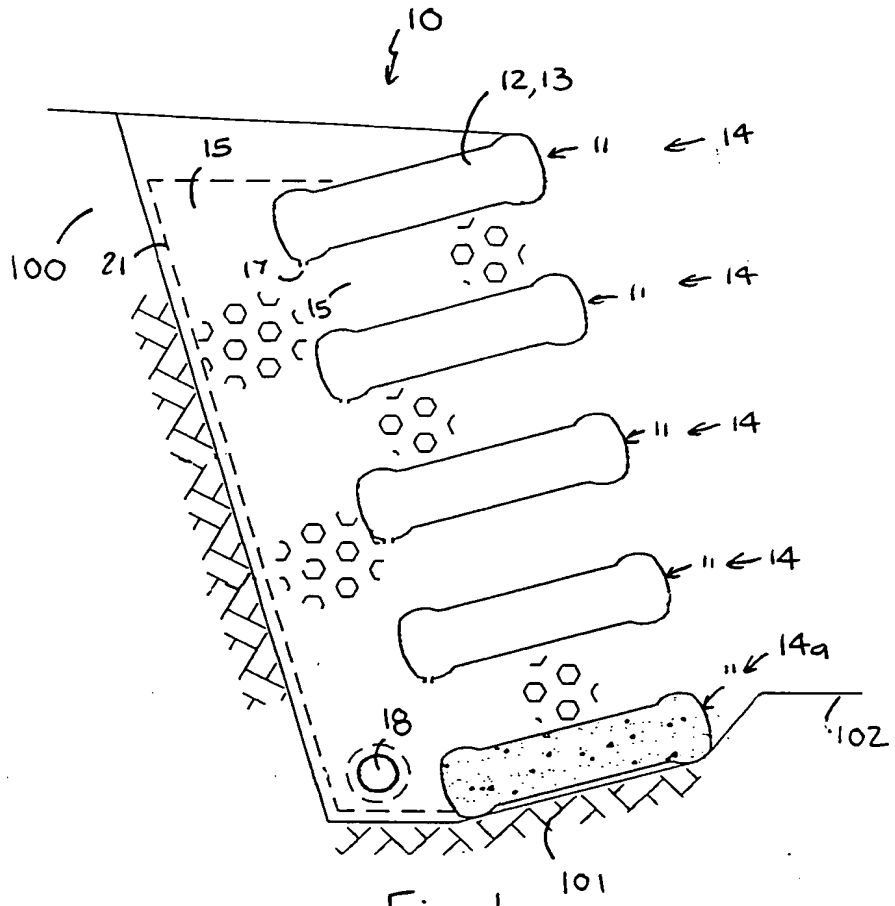
10
12,13
15
11
14
100
21
17
15
11
14
11
14
11
14
14a
18
102
101

Fig. 1

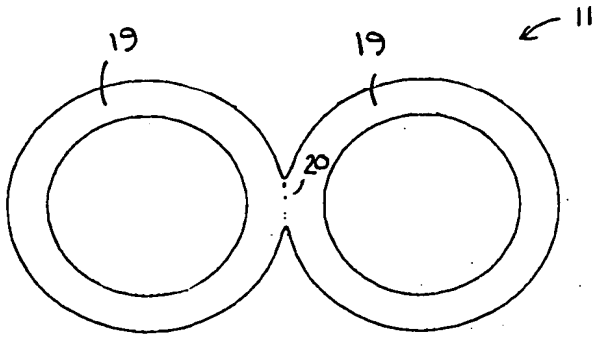
19
19
11
20

Fig. 2

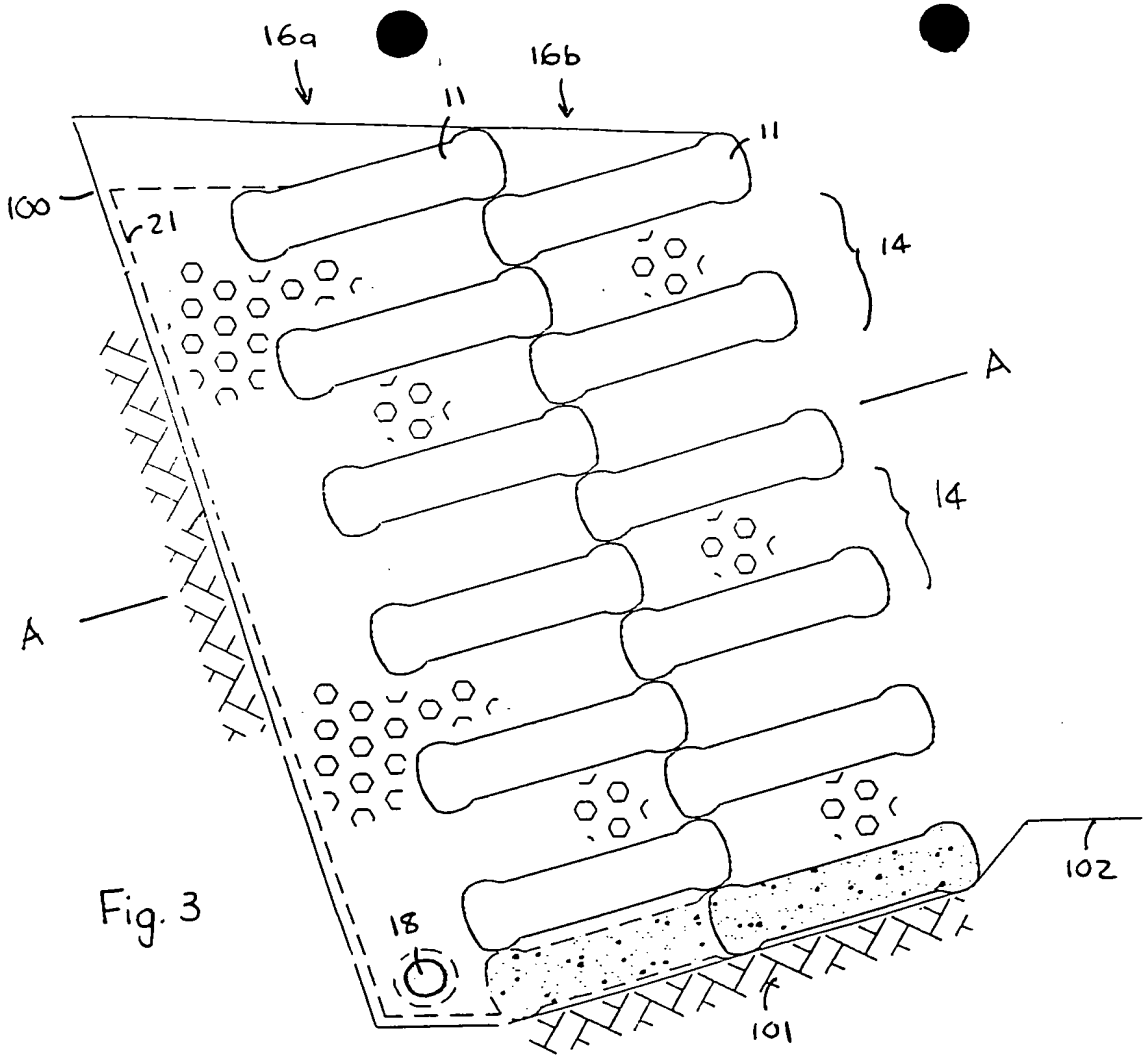

Fig. 3

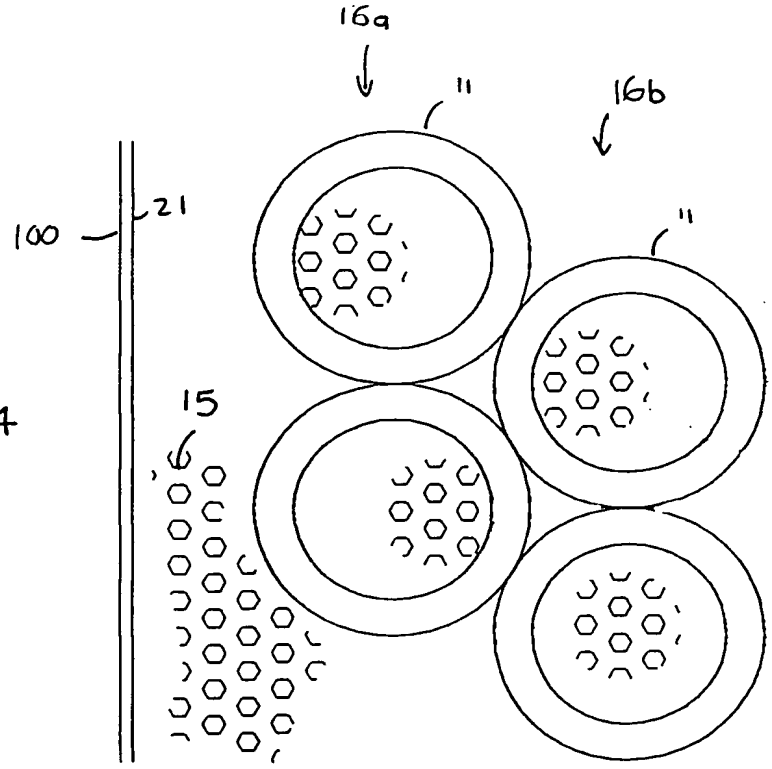

Fig. 4